




# Incremental Risk Charge

## IRC Definition

- ◆ The incremental risk charge is a regulatory requirement from the Basel Committee in response to the financial crisis. It captures risk beyond regular value at risk.
  - ◆ IRC supplements existing Value-at-Risk (VaR) and captures the loss due to default and migration events at a **99.9%** confidence level over a **one-year** capital horizon.
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## IRC Main Features

- ◆ Liquidity is explicitly modeled in IRC through liquidity horizon and constant level of risk.
- ◆ Constant level of risk assumption
  - ◆ Hold portfolio constant over liquidity horizon
  - ◆ Rebalance any default, downgraded, or upgraded positions at the beginning of each liquidity horizon
  - ◆ Roll over any matured positions at the beginning of each horizon
- ◆ Default and migration need to be simulated for one-year horizon.
- ◆ Concentration measures the degree of a portfolio diversification.  
For example, if a significant number of issuers belong to a certain category, the portfolio is a concentrated one.

## Default and Migration Simulation

- ◆ Default and credit migration is commonly modeled by an asset model:

$$z_i = \beta_i \phi + \sqrt{1 - \beta_i^2} \varepsilon_i$$

where

$\phi$  is the systematic risk;

$\varepsilon_i$  is the idiosyncratic risk for issuer/obligor  $i$ ;

$\beta_i$  is the weighted correlation that systematic risk factor affects issuer/obligor  $i$ ;

$z_i$  is the normalized asset return or creditworthiness indicator for issuer/obligor  $i$ .

## Default and Migration Simulation (Cont'd)

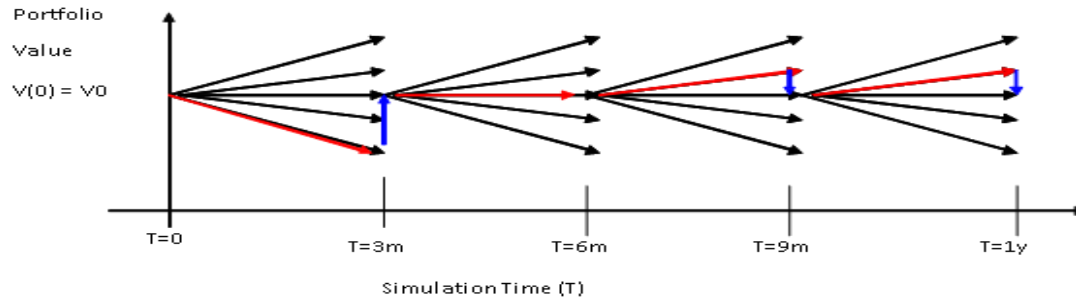
- ◆ Determination of default and credit migration
  - ◆ Given historical default and transition probabilities (also called default transition matrix), the thresholds of default and credit migration can be computed.
  - ◆ For example, we can compute various rating thresholds for a BBB issuer as  $Z_{BBB}^D, Z_{BBB}^{CCC}, Z_{BBB}^B, Z_{BBB}^{BB}, Z_{BBB}^{BBB}, Z_{BBB}^A, Z_{BBB}^{AA}, Z_{BBB}^{AAA}$
  - ◆ If the simulated and normalized asset value  $z_i$  is between  $Z_{BBB}^A$  and  $Z_{BBB}^{AA}$ , it means the issuer is migrated from BBB to AA, verse vice.
  - ◆ Similarly if the simulated asset value  $z_i$  is smaller than  $Z_{BBB}^D$ , the issuer defaults

## Constant level of risk

- ◆ The constant level of risk reflects recognition by regulators that securities/derivatives held in the trading book are generally much more liquid than those in the banking book.
- ◆ We interpret constant level of risk as constant loss distribution, i.e.,
  - ◆ The same loss distribution over each liquidity horizon
  - ◆ The same rating over each liquidity horizon
  - ◆ The same risk metrics over each liquidity horizon
- ◆ For example, the liquidity horizon for a portfolio is 3 months. That means the bank holds its portfolio components constant for 3 months and then rebalances it by replacing any default or downgraded or upgraded positions so that the portfolio is returned to the initial level of risk.

## Constant level of risk (Cont'd)

- ◆ The process is repeated four times to arrive at 1-year shown as



- ◆ In Monte Carlo context, this can be modeled by drawing 4 times from the single-period loss distribution measured over the liquidity horizon.
- ◆ The advantages of this assumption
  - ◆ Avoid the complexity of rebalancing and roll-over
  - ◆ Reduce computation significantly

## Implementation

- ◆ Find all debt and credit deals.
- ◆ Banks can assign a liquidity horizon to each deal under conservative assumption. The liquidity horizon has a floor of 3 months
- ◆ Divide deals into portfolios based on liquidity horizons.
- ◆ Assuming that a portfolio has 3-months liquidity horizon, compute 3-month loss distribution as follows
  - ◆ Simulate default and migration at 3 months
  - ◆ If default:  $DefaultLoss_{i,3m} = Exposure_{i,3m} * LGD_i$
  - ◆ If rating change:  $MigrationLoss_{i,3m} = MTM_{i,3m,newRating} - MTM_{i,0,oldRating}$
  - ◆ Total loss:  $loss_{3m} = \sum_i DefaultLoss_{i,3m} + \sum_j MigrationLoss_{j,3m}$
  - ◆ Repeat for all scenarios to generate 3 month loss distribution





Reference:

<https://finpricing.com/lib/EqConvertible.html>

